

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-323135  
 (43)Date of publication of application : 08.11.2002

(51)Int.Cl. F16J 15/08  
 F02F 11/00

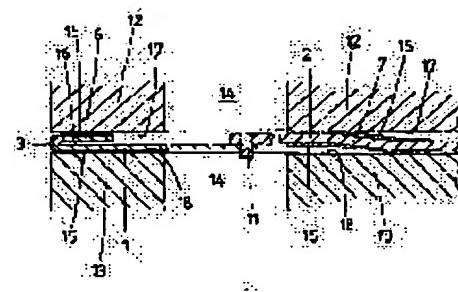
(21)Application number : 2001-127784 (71)Applicant : NIPPON GASKET CO LTD  
 (22)Date of filing : 25.04.2001 (72)Inventor : WATANABE TAKUYA  
 UEMURA HIROSHI

## (54) SINGLE-LAYER METAL GASKET

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To constitute this single-layer metal gasket by a single seat of metal plate in a total region connecting internal/external peripheral metal plates, and reducing a tightening thickness, while a structure is constituted simple.

**SOLUTION:** This single-layer metal gasket has an internal peripheral metal plate 1 formed with an internal peripheral region in the periphery of a hole 3 for gas to pass and an external peripheral metal plate 2 formed with an external peripheral region connected to the internal peripheral metal plate 1. The external peripheral metal plate 2 has elasticity higher than of the internal peripheral metal plate 1, to be formed with a half bead 7 along an opening 4. The inner peripheral metal plate 1 is formed with a fold back part 6 along the hole 3, a region of the fold back part 6 is formed with a thickness with increasing part, formed thicker than that other than this region. Plate thickness of the internal peripheral metal plate 1 is formed thinner than a plate thickness of the external peripheral metal plate 2.



### LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's  
decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

**\* NOTICES \***

JPO and NCIPI are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

**CLAIMS**

---

**[Claim(s)]**

[Claim 1] the hole with which the hole which gas passes was formed — a surrounding inner circumference field The inner circumference metal plate to form, And it has the periphery metal plate which forms periphery fields other than said inner circumference field connected with the periphery part of said inner circumference metal plate by the bond part. Said periphery metal plate elasticity higher than said inner circumference metal plate It is formed with the elastic metal plate which it has. Said periphery metal plate is equipped with the half bead formed along with opening formed along with the periphery part of said inner circumference metal plate, and said opening. It is the single-level-metal gasket which it meets at said hole at said inner circumference metal plate, and the section is formed by return, and consists of the field of said clinch section being formed in the thickening section formed more thickly than fields other than the clinch section.

[Claim 2] The board thickness of said inner circumference metal plate is a single-level-metal gasket according to claim 1 which consists of being formed more thinly than the board thickness of said periphery metal plate.

[Claim 3] Said bond part of said inner circumference metal plate and said periphery metal plate is a single-level-metal gasket according to claim 1 or 2 which consists of it being the structure which the laminating of said periphery part of said inner circumference metal plate and the perimeter [ opening ] part which met said opening of said periphery metal plate was carried out, and it joined in said periphery part and said perimeter [ opening ] part.

[Claim 4] Said bond part of said inner circumference metal plate and said periphery metal plate is a single-level-metal gasket according to claim 1 or 2 which consists of it being the structure which welded the periphery edge of said periphery part of said inner circumference metal plate, and the inner circumference edge of the perimeter [ opening ] part which met said opening of said periphery metal plate.

[Claim 5] Said bond part of said inner circumference metal plate and said periphery metal plate is a single-level-metal gasket given in any 1 term of claims 1-4 which consist of being arranged so that it may be located in the field of the engine water jacket formed in the cylinder block at least.

[Claim 6] The thickness of said thickening section of said inner circumference metal plate is a single-level-metal gasket given in any 1 term of claims 1-5 which consist of it not being thinner than the thickness of said periphery metal plate.

[Claim 7] A single-level-metal gasket given in any 1 term of claims 1-6 which consist of the enveloping layer of an elasticity member being formed in the external surface of said thickening section of said inner circumference metal plate, and/or the external surface of said half bead of said periphery metal plate.

[Claim 8] A single-level-metal gasket given in any 1 term of claims 1-7 which change from being placed between the clearances formed between the opposed faces of said clinch section by elasticity material to said clinch section of said inner circumference metal plate.

[Claim 9] A single-level-metal gasket given in any 1 term of claims 1-7 which consist of the heights for adjusting the amount of clearances of the clearance formed between the opposed

faces of said clinch section to said clinch section of said inner circumference metal plate being prepared.

[Claim 10] Said heights prepared in said clearance formed between the opposed faces of said clinch section are the single-level-metal gaskets of claim 9 which consists of being formed by the height and/or the interstitial segment material which project in said opposed face of said clinch section.

---

[Translation done.]

**\* NOTICES \***

JPO and NCIPI are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

**DETAILED DESCRIPTION**

---

**[Detailed Description of the Invention]****[0001]**

[Field of the Invention] This invention is arranged and used between the opposed faces of members, such as a cylinder block which constitutes engines, such as car motor, the cylinder head, and a manifold, and it relates to the single-level-metal gasket which can reduce bolting thickness with a bolt while it is equipped with the hole which gas, such as combustion gas and exhaust gas, passes especially.

**[0002]**

[Description of the Prior Art] Conventionally, what was indicated by JP,1-118147,U is known as a metal laminating form gasket. The metal plate laminating form gasket for internal combustion engines indicated by this official report consists of metal plates of a vertical pair, turns up one metal plate, forms the section in the combustion chamber hole seal section by return, it arranges a metal plate on another side so that it may not lap with the clinch section, and it forms a bead in the perimeter of a liquid hole at the metal plate of another side.

[0003] Moreover, the compound gasket is indicated by publication of unexamined utility model application Heisei 1-154364. Among the members arranged face to face, this compound gasket constitutes thinly the thick board thickness of the 2nd gasket member by which a part for a small surface part (periphery side) is equipped with deformation in the board thickness of the 1st gasket member by which a part for a large surface part (circumference of a boa hole) is equipped with deformation, and connects the 1st gasket member and the 2nd gasket member with one in a necessary part.

[0004] Furthermore, the metallic gasket indicated by JP,8-200506,A A cylinder bore hole, a bolthole, an oil gallery, and a hydrosphere are formed in a substrate, the section is formed in the edge of a cylinder bore hole by return, and elasticity material is won over to the interior of the clinch section. In the periphery edge of a substrate The crosswise whole of a substrate, A part [ / between the boltholes of a longitudinal direction and near the bolthole ] is turned up, and the section is formed by return, and it is formed in both the planes of composition of a substrate so that a rubber bead may become higher than the height of a clinch in the location which divides a hole.

[0005] Moreover, the metallic gasket indicated by the publication-number I0 No. -267130 official report is a veneer configuration or a double plate configuration equipped with the gasket configuration plate which consists of an elastic metal plate in which the bead for seals was formed, and it forms the degree-of-hardness modification field set up so that a degree of hardness might become low at a part of die-length direction [ at least ] of a bead in order to adjust the planar pressure in a bead. The section and a full bead are formed by return [ metallic gasket / this / circumference / boa hole ], and the half bead is formed in the periphery section.

**[0006]**

[The technical problem which invention makes solution \*\*\*\*\*] However, although the compound gasket indicated by above-shown publication of unexamined utility model application Heisei 1-154364 is related with the monolayer gasket which has prepared neither a bead nor the clinch section in the 1st gasket member and the 2nd gasket member, even if the bolting

thickness as a gasket is prescribed by the thick plate part of the boa hole circumference and tends to decrease bolting thickness, a limitation produces it in reduction in thickness.

[0007] The bead by itself is not formed in a metal plate, the metallic gasket indicated by above-shown JP,8-200506,A has the composition of making a seal function important also for the rubber bead which is an elasticity sealant although it is the structure simplified at this point achieving, and the formation process of the clinch section in the bolthole circumference is needed.

[0008] The metallic gasket indicated by the above-shown publication-number I0 No. -267130 official report In order to make the full bead of the clinch section immediately formed in a periphery achieve a two-stage-sealing function it is related with a configuration — \*\*\*\*\* — quality control is required, spring nature and the opposite property of description without a processing crack may be required of a metal plate, it may be limited to the quality of the material [ need / still / for example, after processing / to be heat-treated ] etc., and there is much constraint on quality-of-the-material selection.

[0009] Since priority is given to filling the conditions on which the function of the thickening section which a crack did not generate at the time of clinch processing, but was turned up over long duration is maintained with the structure which prepared the clinch section as a single-level-metal gasket although the usable ingredient of a metal plate is chosen when it is going to manufacture cheaply, possibility of becoming selection of ingredients, such as the usual low elastic stainless steel, is high. Even if it forms the bead for carrying out the seal of the pore, setting arises immediately at the time of bolting, and spring nature disappears and it becomes impossible however, to demonstrate a reliable seal function in the low elastic metallic material which gave priority to the above clinch \*\*\*\*.

[0010] Therefore, the single-level-metal gasket which was excellent in seal nature or durability about the metallic gasket with the metallic material of low elasticity under the design condition which does not prepare the bead for example, by the elasticity sealant, and especially the thing for which the cylinder head gasket for engines is manufactured are difficult things. Structure which sets to the conventional laminating form cylinder head gasket, thickens thickness of the boa hole periphery of a gasket since expanding and contracting between the deformation of the boa circumference, and the cylinder head and the cylinder block by the side of an engine are large, or the periphery of a boa hole thickens by the laminating of a metal plate is common. Consequently, the thickness of a gasket is prescribed by the thickness of the periphery of a boa hole, and serves as constraint in the case of reducing the bolting thickness of the gasket by the cylinder head and the cylinder block.

[0011]

[Means for Solving the Problem] While having the hole which the purpose of this invention is arranged and used between the opposed faces of members, such as a cylinder block which constitutes engines, such as car motor, the cylinder head, and a manifold, and gas, such as combustion gas and exhaust gas, passes especially bolting thickness with a bolt — it can decrease — substantial — the whole region — crossing — from the metal plate of one sheet — a configuration — fundamentally The circumference of a hole is met without forming the full bead as an object for the main seals of said hole, and the bead by the elasticity sealant, and the section is formed by return, the degree of freedom of a design is high, and it is offering the single-level-metal gasket which has a cheap and simple configuration.

[0012] the hole with which the hole with which gas passes this invention was formed — a surrounding inner circumference field The inner circumference metal plate to form, And it has the periphery metal plate which forms periphery fields other than said inner circumference field connected with the periphery part of said inner circumference metal plate by the bond part. Said periphery metal plate elasticity higher than said inner circumference metal plate It is formed with the elastic metal plate which it has. Said periphery metal plate is equipped with the half bead formed along with opening formed along with the periphery part of said inner circumference metal plate, and said opening. It meets at said hole at said inner circumference metal plate, and the section is formed by return and the field of said clinch section is related with the single-level-metal gasket which consists of being formed in the thickening section formed more thickly

than fields other than the clinch section.

[0013] The board thickness of said inner circumference metal plate is formed more thinly than the board thickness of said periphery metal plate.

[0014] Said bond part of said inner circumference metal plate and said periphery metal plate is the structure which the laminating of said periphery part of said inner circumference metal plate and the perimeter [ opening ] part which met said opening of said periphery metal plate was carried out, and it joined in said periphery part and said perimeter [ opening ] part. Or said bond part of said inner circumference metal plate and said periphery metal plate is the structure which welded the periphery edge of said periphery part of said inner circumference metal plate, and the inner circumference edge of the perimeter [ opening ] part which met said opening of said periphery metal plate.

[0015] Said bond part of said inner circumference metal plate and said periphery metal plate is arranged so that it may be located in the field of the engine water jacket formed in the cylinder block at least.

[0016] In this single-level-metal gasket, the thickness of said thickening section of said inner circumference metal plate is not thinner than the thickness of said periphery metal plate.

[0017] The enveloping layer of an elasticity member is formed in the external surface of said thickening section of said inner circumference metal plate, and/or the external surface of said half bead of said periphery metal plate.

[0018] It is placed between the clearances formed between the opposed faces of said clinch section at said clinch section of said inner circumference metal plate by elasticity material.

[0019] The heights for adjusting the amount of clearances of the clearance formed between the opposed faces of said clinch section are prepared in said clinch section of said inner circumference metal plate.

[0020] Said heights prepared in said clearance formed between the opposed faces of said clinch section are formed by the height and/or the interstitial segment material which project in said opposed face of said clinch section.

[0021] As mentioned above, in the inner circumference field in which a boar hole or an exhaust hole exists, the section is formed by return fundamentally, in the periphery field in which holes, such as a hydrosphere, a bolthole, and an oil gallery, exist, a half bead can be formed, the configuration of this single-level-metal gasket itself is simple, it can reduce the bolting thickness of a gasket, and its degree of freedom of a design can increase. Moreover, it is formed with the sheet metal of low elasticity, the clinch section in which a crack does not exist is formed, and the metal plate which constitutes the inner circumference field of a gasket can maintain the function of the clinch section. Moreover, it is formed with the thick plate of high elasticity, a half bead is formed in the inner circumference field, and the metal plate which constitutes the periphery field of a gasket can maintain a firm seal function by spring nature.

[0022] Moreover, although the section is formed in the metal plate which constitutes the inner circumference field of a gasket by return, the bolting thickness of a gasket does not increase so much by using sheet metal as a metal plate. Therefore, the degree of freedom of the bolting thickness of much more gasket increases with the combination of the board thickness of the metal plate chosen depending on the design condition of a gasket. Using SUS304 as an ingredient of sheet metal, SUS301 can be used for the combination of the most desirable ingredient in a gasket as an ingredient of a thick plate, and it can usually choose a cheap ingredient on a target.

[0023]

[Embodiment of the Invention] Hereafter, with reference to a drawing, the example of the single-level-metal gasket by this invention is explained. Drawing 1 one example of the single-level-metal gasket by this invention The shown top view, A sectional view [ in / in drawing 2 / the I-I cross section of the single-level-metal gasket of drawing 1 ], the top view showing the inner circumference metal plate with which drawing 3 constitutes the single-level-metal gasket of drawing 1 , the top view showing the periphery metal plate with which drawing 4 constitutes the single-level-metal gasket of drawing 1 , and drawing 5 another example of the single-level-metal gasket by this invention The shown top view, the sectional view showing the field corresponding

to the II-II cross section of the single-level-metal gasket of drawing 5 in drawing 6 , the top view showing the inner circumference metal plate with which drawing 7 constitutes the single-level-metal gasket of drawing 5 , and drawing 8 the periphery metal plate which constitutes the single-level-metal gasket of drawing 5 They are the sectional view in which the shown top view, the sectional view in which drawing 9 shows still more nearly another example (a) of the clinch section and (b), and drawing 10 show other examples (a) and (b) of the clinch section, and (c), and the sectional view where drawing 11 shows the example of further others of the clinch section (a), and (b) to a list.

[0024] The single-level-metal gasket by this invention was arranged and used between the opposed faces of members, such as the cylinder block 13 which constitutes engines, such as car motor, the cylinder head 12, and a manifold (not shown), and is equipped with the hole 3 which gas, such as combustion gas and exhaust gas, passes especially. The single-level-metal gasket used for each illustrated example, having arranged between the opposed face 17 of the cylinder head 12 and a cylinder block 13 and 18 is shown. The example in which the engine water jacket 14 was formed is shown in the cylinder head 12 and a cylinder block 13 at drawing 2 and drawing 11 . Moreover, the example in which the engine water jacket 14 was formed is shown to the cylinder block 13 by drawing 6 .

[0025] In the inner circumference field in which the exhaust hole (not shown) to which the boa hole 3 with which combustion gas flows, exhaust gas, etc. pass this single-level-metal gasket fundamentally exists, the section 6 is formed by return, and the half bead 7 is formed in the periphery field in which the hole of a hydrosore 9, a bolthole 8, and oil-gallery 10 grade exists. The section 6 is formed by return, and the metal plate 1 which constitutes the inner circumference field of a gasket is formed with the sheet metal of low elasticity, in order [ whose a crack does not exist ] to maintain the function. Moreover, the metal plate 2 which constitutes the periphery field of a gasket is formed with the thick plate of high elasticity rather than sheet metal, in order to maintain a firm seal function by the spring nature by the half bead 7.

[0026] First, with reference to drawing 1 – drawing 4 , the 1st example of the single-level-metal gasket by this invention is explained. the hole with which, as for this single-level-metal gasket, the boa hole 3 which combustion gas passes was mainly formed — it has the inner circumference metal plate 1 which forms a surrounding inner circumference field, and the periphery metal plate 2 which forms periphery fields other than the inner circumference field connected with the periphery part of the inner circumference metal plate 1 by the bond part 11, and the periphery metal plate 2 is formed with the elastic metal plate which has elasticity higher than the inner circumference metal plate 1. The periphery metal plate 2 is equipped with the half bead 7 formed along with opening 4 and opening 4 which were formed along the inner circumference field of the inner circumference metal plate 1. The boa hole 3 is met at the inner circumference metal plate 1, the section 6 is formed by return and the field of the annular clinch section 6 is formed in the thickening section formed more thickly than fields other than clinch section 6.

[0027] As shown in drawing 2 , the single-level-metal gasket with which the 1st example was applied to the engine of the opening deck type with which the engine water jacket 14 is formed in the circumference of a combustion chamber is shown. The bond part 11 of the inner circumference metal plate 1 and the periphery metal plate 2 is the structure to which the laminating of the periphery part of the inner circumference metal plate 1 and the perimeter [ opening ] part which met the opening 4 of the periphery metal plate 2 was carried out, and it joined the periphery part and the perimeter [ opening ] part in total. The junction of eye a pigeon, the below-mentioned joining ( drawing 6 ), welding, sticking by pressure, or adhesion other than the bundle in mechanical can be used for a bond part 11. This single-level-metal gasket consists of metal plates of one sheet over the whole region substantially by being connected by the bond part 11 of the inner circumference metal plate 1 and the periphery metal plate 2. In drawing 2 , the bond part 11 of the inner circumference metal plate 1 and the periphery metal plate 2 is arranged so that it may be located in the field of the engine water jacket 14 formed in a cylinder block 13 and the cylinder head 12.

[0028] In the single-level-metal gasket of this example, it has the structure where neither a full

bead like before as a main seal nor the bead by the elasticity sealant was formed, and only the clinch section 6 for seals was fundamentally formed along with the circumference of the boa hole 3, in the inner circumference metal plate 1. Moreover, the half bead 7 is formed in the periphery metal plate 2 along with opening 4, and the half bead 30 is further formed in it along with the hole of a hydrosore 9, a bolthole 8, and oil-gallery 10 grade. Furthermore, the board thickness of the inner circumference metal plate 1 is formed more thinly than the board thickness of the periphery metal plate 2. The inner circumference metal plate 1 consists of elastic metal plates of low elasticity, and the periphery metal plate 2 consists of elastic metal plates of the high elasticity which has elasticity higher than the inner circumference metal plate 1.

[0029] The inner circumference metal plate 1 and the periphery metal plate 2 which constitute this single-level-metal gasket can select the following ingredients. The inner circumference metal plate 1 can be produced with the low elastic stainless steel of for example, SUS304 grade, and can produce the periphery metal plate 2 with the high elasticity stainless steel for springs of for example, SUS301 grade. When you need high intensity and durability to the inner circumference metal plate 1, it can produce using the austenitic stainless steel of the Cr-Mn-N system of high intensity which has cold-working nature, the bilayer stainless steel by the same ingredient, etc.

[0030] As shown in drawing 2, the enveloping layer 15 of elasticity material is given to the field [ which touches the opposed face 17 of the cylinder head 12 ], field [ which touches the opposed face 18 of a cylinder block 13 ], and boa hole 3 side of the \*\*\* return section 6 about the inner circumference metal plate 1. Moreover, the half beads 7 and 30 are formed in the periphery metal plate 2 along with the hole of opening 4, a hydrosore 9, a bolthole 8, and oil-gallery 10 grade, and the enveloping layer 15 of elasticity material is given to the part of the half beads 7 and 30. The enveloping layer 15 of elasticity material is constructed so that the boundary section with an engine water jacket 14 may be covered. Specifically, an enveloping layer 15 can consist of coating layers for micro seals, such as gum, a graphite web material, etc. Moreover, the enveloping layer 15 given to the inner circumference metal plate 1 and the periphery metal plate 2 may be given to those both sides, one side, or some parts.

[0031] Furthermore, it is formed in the configuration which has a clearance 16 by the clinch section 6 of the inner circumference metal plate 1, and conditions before bolting are consisted of by the condition that the clinch section 6 was equipped with elastic force at it. Moreover, as for the thickness of the thickening section 6 of the inner circumference metal plate 1 of sheet metal, i.e., the clinch section, it is desirable to form so that it may become that it is not thinner than the thickness of the periphery metal plate 2, i.e., an EQC, or the thickness beyond it. By constituting the clinch section 6 of the inner circumference metal plate 1 in the thickening section, a certainly good seal is securable for the circumference of the boa hole 3. At this time, the thickness of the thickening section of the clinch section 6 of it being suppleable with an enveloping layer 15 is also natural. Therefore, the thickness of an enveloping layer 15 may be contained in the whole thickening section thickness of the clinch section 6, and the thickness of the thick plate of the periphery metal plate 2 in a setup of the thickness about the clinch section 6 and the periphery metal plate 2.

[0032] Next, with reference to drawing 5 – drawing 8, the 2nd example of the single-level-metal gasket by this invention is explained. Although the single-level-metal gasket of the 2nd example has the same configuration as the single-level-metal gasket of the 1st example fundamentally, the connection structures of the inner circumference metal plate 1 and the periphery metal plate 2 differ. The bond part 19 of the inner circumference metal plate 1 and the periphery metal plate 2 is constituted from the 2nd example by the structure which the periphery edge 5 of the periphery part of the inner circumference metal plate 1 and inner circumference marginal 4E of the perimeter part of the opening 4 which met the opening 4 of the periphery metal plate 2 welded.

[0033] In the 2nd example, it is connected by welding etc. in the field of the water pore 14, i.e., an engine water jacket, without suiting in the inner circumference metal plate 1, the periphery metal plate 2, or a pile. The 2nd example is the structure where the engine water jacket is not formed in the cylinder head 12. When there is no engine water jacket of the cylinder head 12, and

when you make it vomit and there are no allowances in the tooth space of construction As shown in drawing 6 , according to the difference of the thickness of the inner circumference metal plate 1 and the periphery metal plate 2 You make it located in the condition of having turned the level difference section 31 to generate to the cylinder block 13 side, a welding 19, i.e., a joint, is formed in the level difference section 31, and it solves further by constituting the sense of the half bead 7 of the periphery metal plate 2 in the condition and reverse sense of drawing 2 of the 1st example. It forms in the hoop direction of the level difference section 31 partially as mentioned above, and also a joint 19 may be formed in the shape of continuation over the perimeter of the level difference section 31.

[0034] Next, with reference to drawing 9 , the 3rd example of the single-level-metal gasket by this invention is explained. Although this single-level-metal gasket is not illustrated, fundamentally, it has the configuration in the same structure as the 1st example and the 2nd example. The clinch section 6 which the metal plate of the same thickness with the even inner circumference metal plate 1 was turned up, and was formed is shown in (a) of drawing 9 . Moreover, as for the inner circumference metal plate 1, a level difference 21 is processed for the field of the clinch section 6 by (b) of drawing 9 , the part is formed in the size of sheet metal, and other fields are the thickness of the usual size which is not thin. Therefore, the single-level-metal gasket shown in (a) of drawing 9 is compared with the single-level-metal gasket shown in (b) of drawing 9 , and the thickening section of the section 6 is formed in a thin configuration by return. In other words, the magnitude of a level difference 21 can adjust the amount of thickening of the clinch section 6 of the inner circumference metal plate 1. The inner circumference metal plate 1 of the single-level-metal gasket shown in (b) of drawing 9 can also be set as 2 double less or equal of the thickness of the periphery metal plate 2 by the thickness of the thickening section of the clinch section 6.

[0035] Moreover, it is placed between the clearances 16 formed between the opposed faces of the clinch section 6 at the clinch section 6 by the elasticity material 20, such as an insert ring, in the 3rd example. Furthermore, in this example, the clinch section 6 of the inner circumference metal plate 1 can give change to that width of face, the amount of the clearance 16 between the clinch sections 6, the whole thickening section thickness, and the width of face of the thickening section proper a location and if needed along with the surroundings of a hole 3. These single-level-metal gaskets are the structures where it was placed between the clearances 16 between the clinch sections 6 by the elasticity material 20, and the clinch section 6 is in the condition of having spring nature.

[0036] The gasket with which an engine latest opening deck type is used for this engine although an engine water jacket 14 is formed in the circumference of the boa hole 3 shows the inclination to which the bolting planar pressure of the circumference of the boa hole 3 fell further.

Especially when it is going to correspond with a single-level-metal gasket, it is becoming [ maintaining spring nature by the circumference of a boa hole during the time of bolting, and operation, or ] an important design condition. In this example, the quality of the material is SUS304, and the thickness of the inner circumference metal plate 1 is 0.12mm. Moreover, the quality of the material is SUS301, and the thickness of the periphery metal plate 2 is 0.2mm, for example. In this example, the thickness of the thickening section of the clinch section 6 is formed irrespective of whether an enveloping layer 15 is included more thickly than the thickness of the periphery metal plate 1. Therefore, although the thickening section is formed of a clinch, it becomes possible by selecting the thickness of the inner circumference metal plate 1 thinly as much as possible according to a permissible design condition, and selecting the thickness of the periphery metal plate 2 according to it to decrease the bolting thickness as a gasket of the inner circumference metal plate 1.

[0037] Moreover, with reference to drawing 10 , the 4th example of the single-level-metal gasket by this invention is explained. Although this single-level-metal gasket is not illustrated, fundamentally, it has the configuration in the same structure as the 1st example and the 2nd example. Heights for the single-level-metal gasket of the 4th example to adjust the amount of the clearance 16 between the clearances 16 formed between the opposed faces of the clinch section 6 to the clinch section 6 of the inner circumference metal plate 1 are prepared. The

heights prepared in the clinch section 6 can adjust and stabilize the clearance 16 between the clinch sections 6 in the formation processing process and initial bolting process of the clinch section 6.

[0038] Specifically about the single-level-metal gasket shown in drawing 10, the inner circumference metal plate 1 with which the interstitial segment material 22 is arranged as heights is shown in the clearance 16 between the clinch sections 6 at (a) of drawing 10. Elasticity material is sufficient as the quality of the material, or the thing of the metal material formed in the plate itself by press working of sheet metal before clinch processing is sufficient as the interstitial segment material 22. About the inner circumference metal plate 1 of the 4th example, the height of the height is set up according to the amount of the necessary clearance 16 between the clinch sections 6, and it has effectiveness further by return in this case in maintenance of the amount of clearances in use [ between the opposed faces of the member of a gasket ] at the time of accommodation control of the amount of clearances at the time of formation processing of the section 6, and bolting of the gasket between the opposed faces of a member.

[0039] The inner circumference metal plate 1 with which the height 23 which projects to the opposed face inside of the inner circumference metal plate 1 into the turned-up part which forms the section 6 in the clearance 16 between the clinch sections 6 by return as heights is formed in (b) of drawing 10 is shown. Moreover, the inner circumference metal plate 1 with which the height 24 which projects to the opposed face outside of the inner circumference metal plate 1 into the turned-up part which forms the section 6 in the clearance 16 between the clinch sections 6 by return as heights is formed in (c) of drawing 10 is shown. In using the thing of the ingredient of low elasticity as an inner circumference metal plate 1 of the 4th example, the heights 23 and 24 hardly function on a boa seal. Moreover, the single-level-metal gasket shown in (c) of drawing 10 serves as only an operation of maintenance of the amount of clearances at the time of bolting. Moreover, it may not limit to these examples, the most important conditions can achieve a function with the height of the height, continuation annular is sufficient as the height, and intermittence annular is sufficient as the height formed in the inner circumference metal plate 1 of the 4th example, and it is good also as two or more trains, and that of the suitable height change for a circumferential direction being given is natural.

[0040] Moreover, with reference to drawing 11, the 5th example of the single-level-metal gasket by this invention is explained. Although this single-level-metal gasket is not illustrated, fundamentally, it has the configuration in the same structure as the 1st example and the 2nd example. Forming the flection 26 for water encroachment prevention aiming at crevice corrosion prevention, an enveloping layer 25, or the height 23 in the field of the outside of the clinch section 6 can consist of the 5th example suitably. In the 5th example, it has the structure of preventing the corrosion of the clearance for the dead space 27 and 29 produced between the clinch section 6 and a cylinder block 13, between clinch section 6 self, the clinch section 6, and the cylinder head 12.

[0041] A flection 26 is formed in the outside of the clinch section 6, and the single-level-metal gasket with which the continuation annular enveloping layer 25 for water encroachment prevention is formed in the cylinder head 12 side of the outside is shown in (a) of drawing 11. Moreover, in the single-level-metal gasket shown in (a) of drawing 11 R>1, the interstitial segment material 22 as heights which have the same effectiveness as the single-level-metal gasket shown in (a) of drawing 10 is formed, and if the interstitial segment material 22 is a continuation configuration, it has the two-stage-sealing operation which prevents invasion of water in the clearance 16 between the clinch sections 6. Moreover, an enveloping layer 28 is formed in the field by the side of the cylinder head 12 of the clinch section 6, the tip of the clinch section 6 is brought close to (b) of drawing 11 as much as possible to the boundary region of an engine water jacket 14, and further, in order to prevent invasion of water to the clearance 16 side between the tips of the clinch section 6, the inner circumference metal plate 1 formed in the continuation annular enveloping layer 28 is shown. In the 5th example, the enveloping layer 28 for water encroachment prevention prepared in the inner circumference metal plate 1 also has the effectiveness of binding tight at least and maintaining the amount of clearances at the

time.

[0042]

[Effect of the Invention] Since it is constituted as mentioned above and a boa hole boundary region consists of inner circumference metal plates of sheet metal, the bolting thickness as a gasket can decrease and the degree of freedom of a design can constitute the single-level-metal gasket by this invention in a gasket high in comparison. Moreover, since this single-level-metal gasket did not form the full bead for the main seal etc. in the inner circumference metal plate in principle attaining a boa hole seal but formed the clinch section although the gasket itself may be comparatively alike, it may serve as structure of a simple monolayer and may form the height as an auxiliary seal depending on the case. Also in such a case, a reliable gasket can be offered, when the height is formed in the section itself by return and it applies to an opening deck type engine especially. Moreover, it is applicable also to the gasket for EKIMANI arranged between the opposed faces of the cylinder head and an exhaust manifold in addition to the head gasket arranged between the opposed faces of the cylinder head and a cylinder block. Furthermore, depending on a design condition or ingredient selection, this single-level-metal gasket is cheap, and economical efficiency can offer a high gasket. Furthermore, this single-level-metal gasket can respond also to the design condition of high intensity by ingredient selection with an inner circumference metal plate and a periphery metal plate.

---

[Translation done.]

**\* NOTICES \***

JPO and NCIPI are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

**DESCRIPTION OF DRAWINGS**

---

**[Brief Description of the Drawings]**

[Drawing 1] It is the top view showing one example of the single-level-metal gasket by this invention.

[Drawing 2] It is a sectional view in the I-I cross section of the single-level-metal gasket of drawing 1.

[Drawing 3] It is the top view showing the inner circumference metal plate which constitutes the single-level-metal gasket of drawing 1.

[Drawing 4] It is the top view showing the periphery metal plate which constitutes the single-level-metal gasket of drawing 1.

[Drawing 5] It is the top view showing another example of the single-level-metal gasket by this invention.

[Drawing 6] It is the sectional view of the field corresponding to the II-II cross section of the single-level-metal gasket of drawing 5.

[Drawing 7] It is the top view showing the inner circumference metal plate which constitutes the single-level-metal gasket of drawing 5.

[Drawing 8] It is the top view showing the periphery metal plate which constitutes the single-level-metal gasket of drawing 5.

[Drawing 9] It is the sectional view showing still more nearly another example (a) of the clinch section of the circumference of the hole of this single-level-metal gasket, and (b).

[Drawing 10] It is the sectional view showing other examples (a) of the clinch section of the circumference of the hole of this single-level-metal gasket, (b), and (c).

[Drawing 11] It is the sectional view showing the example of further others of the clinch section of the circumference of the hole of this single-level-metal gasket (a), and (b).

**[Description of Notations]**

1 Inner Circumference Metal Plate

2 Periphery Metal Plate

3 Boa Hole

4 Opening

4E Inner circumference edge

5 Periphery Edge

6 Clinch Section

7 Half Bead

8 Bolthole

9 Water Channel

10 Oil Hole

11 Bond Part (Caulking)

12 Cylinder Head

13 Cylinder Block

14 Engine Water Jacket

15, 25, 28 Enveloping layer

16 Clearance

17 Opposed Face (Cylinder Head)  
18 Opposed Face (Cylinder Block)  
19 Bond Part (Joining)  
20 Elasticity Material  
21 Level Difference  
22 Interstitial Segment Material (Heights)  
23 24 Height  
26 Flection  
27 29 Dead space

---

[Translation done.]

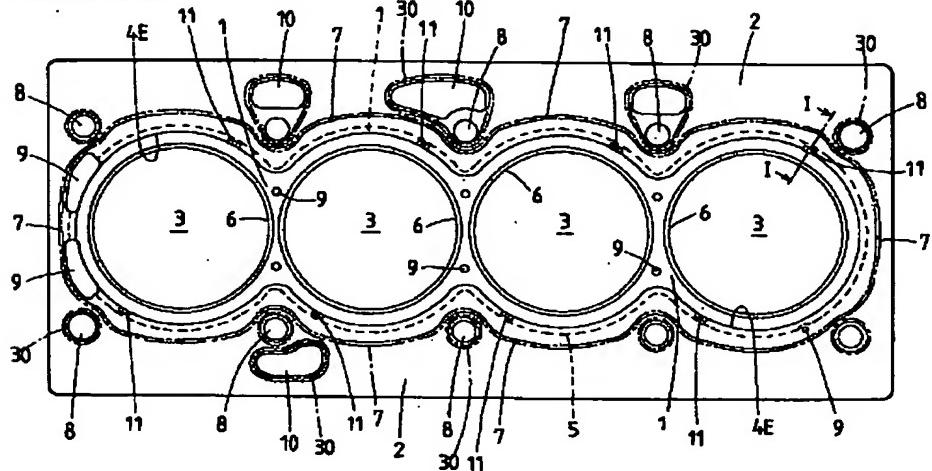
## \* NOTICES \*

JPO and NCIPI are not responsible for any damages caused by the use of this translation.

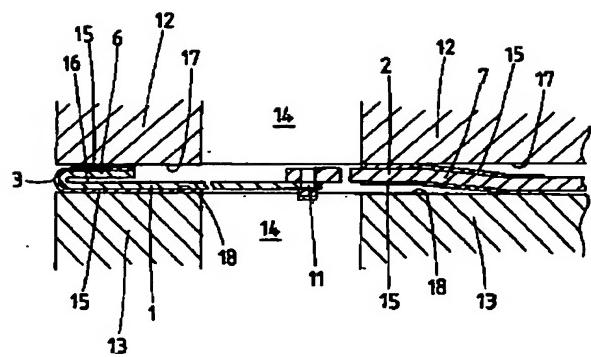
- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
  - 2.\*\*\*\* shows the word which can not be translated.
  - 3.In the drawings, any words are not translated.

## DRAWINGS

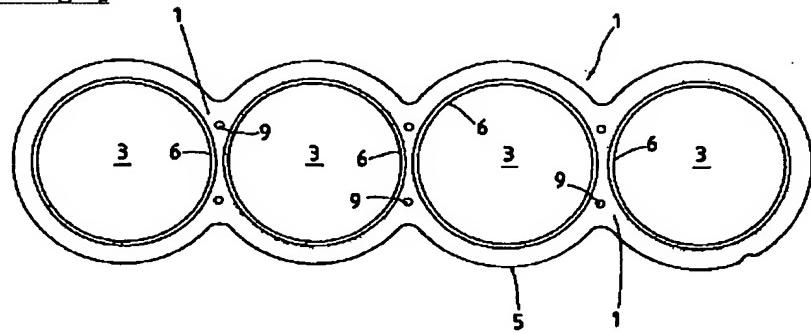
### [Drawing 1]



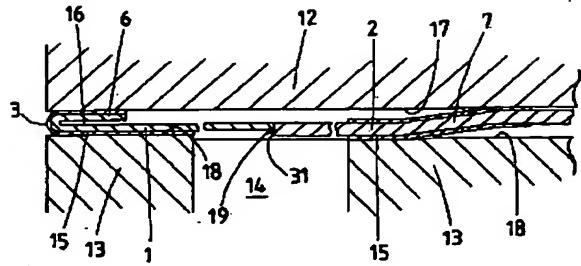
**[Drawing 2]**



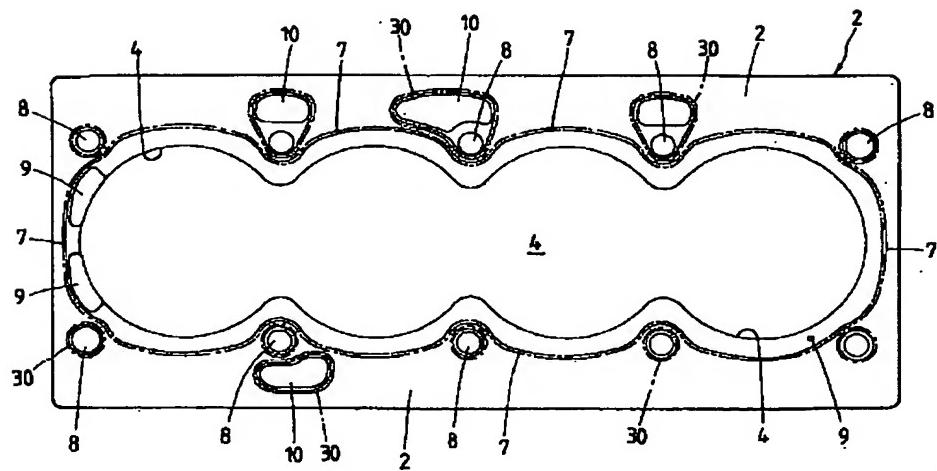
[Drawing 3]



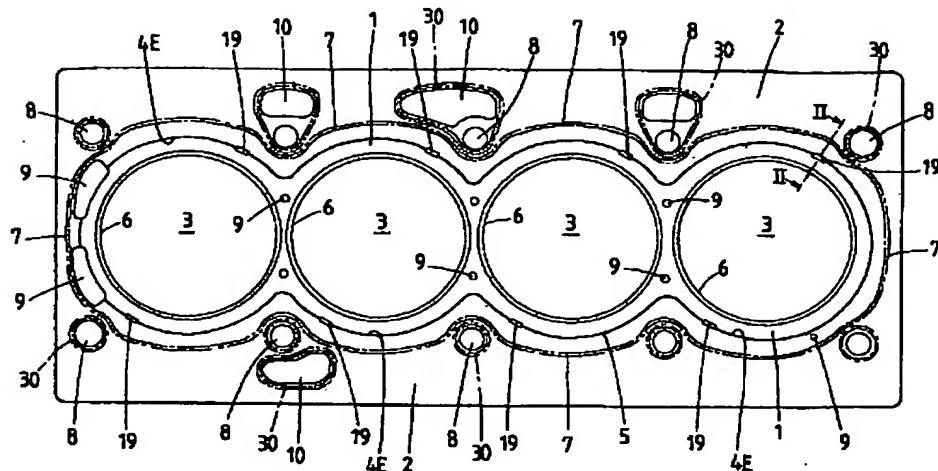
[Drawing 6]



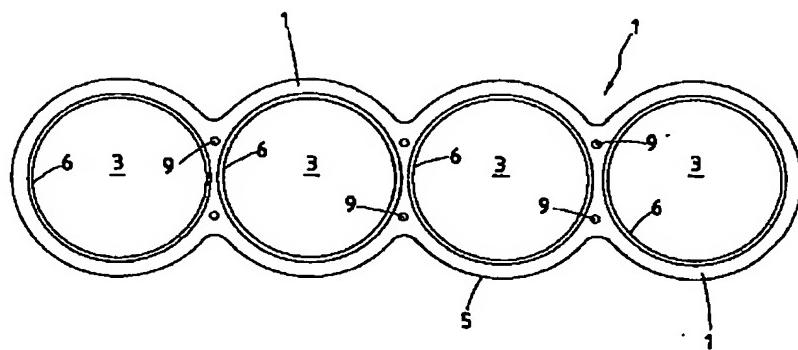
[Drawing 4]



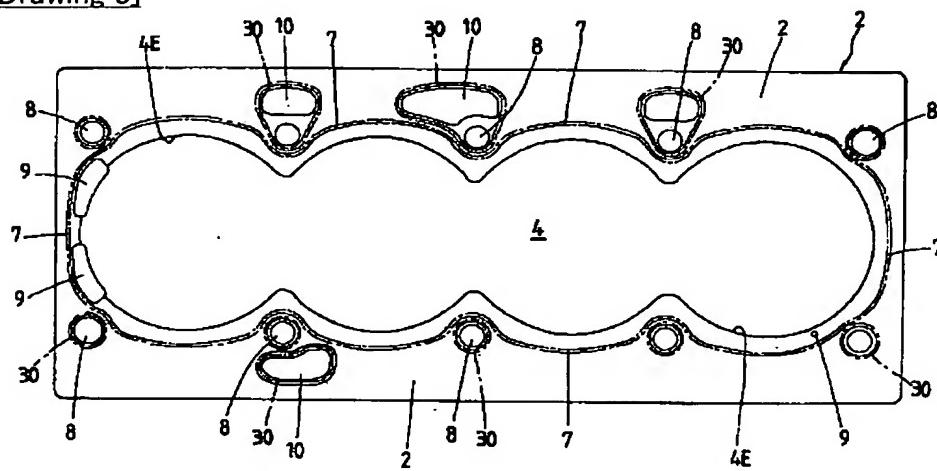
[Drawing 5]



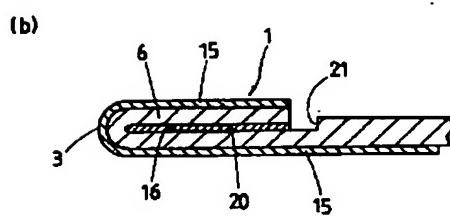
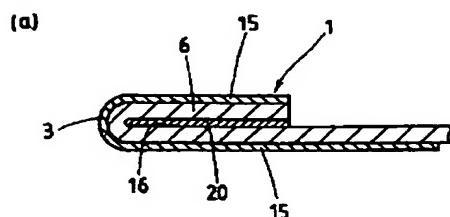
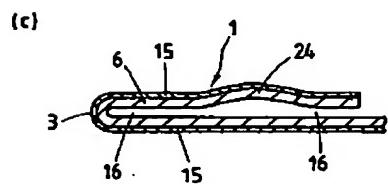
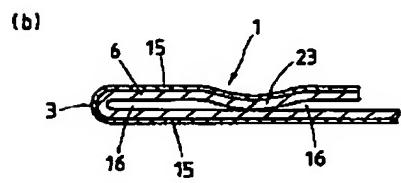
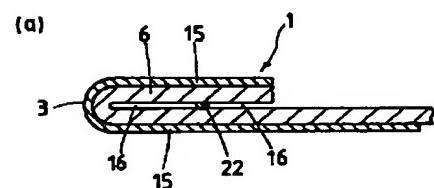
[Drawing 7]

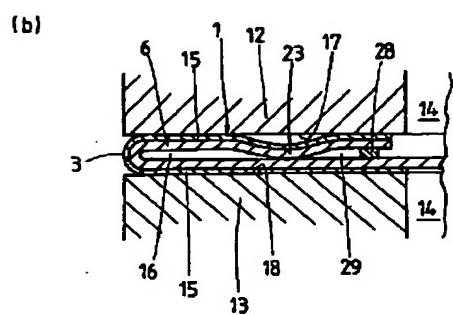
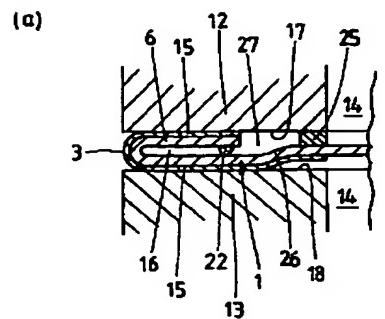


### [Drawing 8]



[Drawing 9]

[Drawing 10][Drawing 11]



---

[Translation done.]